On the probabilistic characterization of drought events

A. Cancelliere¹, B. Bonaccorso, and G. Rossi
Civil and Environmental Engineering Department, University of Catania, Catania, Italy

J. D. Salas
Department of Civil Engineering, Colorado State University, Fort Collins, USA (on sabbatical leave at ETH, Zurich, Switzerland)

Abstract. Drought characterization is an important step in water resources systems planning and management. The assessment of extreme drought events may help decision makers to set effective drought mitigation tools. Drought events can be objectively identified by three main characteristics, namely: drought duration, accumulated deficit and drought intensity. In this paper the joint cumulative distribution functions (cdf’s) of accumulated deficit and duration and of intensity and duration are derived as functions of the stochastic characteristics of the underlying variable, which is assumed to be either normal, lognormal, or gamma distributed. The derived cdf’s are then applied to determine the return period of critical droughts by considering jointly two drought characteristics, e.g. droughts with accumulated deficit and duration greater than or equal to some fixed values. The methodology has been tested and applied using numerical simulations and records of annual precipitation series. The results of such applications show a good correspondence between the observed and the analytical results.

¹ Department of Civil and Environmental Engineering
University of Catania
V.le A. Doria 6, 95125 Catania, Italy
Tel: 0039 095 7382718
e-mail: acance@dica.unict.it